Botanical Gazette.

Vol. VI. JUNE, 1881. No. 6.

Editorial.—In Dr. Rothrock's paper in the May number of the Gazette, page 205, fifth line from the top. ½ *inch* should read 1½ *inches*. In our next number Dr. Rothrock will contribute a paper in which he will contrast German and American modes of teaching.

Summer Schools of Botany seem to be multiplying in our country. Western teachers have begun to demand opportunities of this kind nearer than the Atlantic seaboard. Accordingly, the editor of this journal has thrown open the botanical laboratory of Wabash College to all who desire to spend six weeks in such work, the term to begin July 6th. No sooner had this scheme been well started than there comes a circular from the University of Minnesota stating that a summer school of Botany will be conducted there, beginning July 5th. This school will be under the charge of Prof. C. E. Bessey, than whom there is no western teacher more competent. We are only glad that these two schools are too far apart to feel in the slightest way each other's presence, for the attractions would be all too much on one side if the element of distance did not help to counterbalance.

The Syracuse Botanical Club has had a recasting of its officers, owing to the resignation of some of the former incumbents. The present officers are as follows: President, Mrs. S. M. Rust; Vice Pres., Mrs Still; Cor. Sec., Mrs. Chas. Barnes; Rec. Sec., Mrs. J. M. Rowling; Treas., Mrs. A. D. Fairbanks.

A Guide to the Literature of Botany is being published in London, which will contain a classified collection of botanical works, including nearly 6,000 titles not given in Pritzel's Thesaurus. It is edited by Benjamin Daydon Jackson, Secretary to the Linnean Society. Orders should be sent to Dulau & Co., Booksellers, 37, Soho Square, London.

The Flora of Indiana, through *Compositæ*, has now been completed. This part of the work has been done, and well done, by Prof. Chas R. Barnes of LaFayette. With this number we give the first installment after *Compositæ*, the rest of the work being directly from the hands of the editors of the Gazette. Hence to them will hereafter be addressed any communication in regard to the Catalogue.

Mr. Joseph F. James, of Cincinnati, has presented to the Cincinnati Society of Natural History an interesting paper "On the Geographical Distribution of the Indigenous Plants of the Northeast United States." It makes a pamphlet of 17 pages and brings together in small space

a great mass of scattered observations upon this subject. We occasionally need some one with sufficient patience to look over whole libraries of scientific books and especially periodicals and cull out and put together in compact form all that pertains to some one subject. It saves all the rest of us a great deal of time, besides giving information that would either escape us or be contained in books we could not easily reach. Mr. James has done just this work, and what is almost as important, has carefully referred us to all the sources of his information.

New Plants of New Mexico and Arizona.—VICIA LEUCOPHŒA.—Annual; sparingly villous-hirsute throughout; 2 feet high, climbing by tendrils; stems wing-angled, sparingly branched, slender; leaflets 6, linear-oblong, entire, mucronate; stipules semi-sagittate; peduncles mostly 2-flowered; calyx teeth subequal, as long, or the lower a little longer than the tube; corolla 4 lines long, cream-color, the vexillum purple-veined; style very villous at the apex; legumes pubescent, 8-seeded.

Along streams in the higher mountains of south-western New Mexico, flowering in July and August. Not at all common, and but few specimens obtained. Very distinct from all our other species by its pubescence and the color of the flowers; but the latter in fading change to purple.

PHASEOLUS PARVULUS.—Stems solitary from a small, round, deep-seated tuber, slender, erect, 3–6 inches high, neither branched nor twining; stipules ovate-lanceolate, acuminate; leaflets an inch long, linear-lanceolate, mucronate, entire, or the lateral each with a more or less distinct lobe on the outer margin at the base; peduncles longer than the leaves, mostly 1-flowered; upper lip of the calyx entire, acute, the teeth of the lower longer, lanceolate; corolla ¾ of an inch long and narrow, deep violet; the linear legume nearly straight, more than an inch long, compressed, 8–10-seeded; seeds short-reniform, smooth, flecked with purple.

Abundant in deep woods of *Pinus ponderosa*, in the Pinos Altos Mountains, New Mexico, flowering in August. A diminutive, but with its large, violet corollas, most elegant species. The long peduncles are not rarely 2-flowered, bearing one at the end and the other an inch below it. The tuber is no larger than an ordinary hazel-nut, and never produces more than the one stem.

POLEMONIUM FLAVUM.—Stem 2–3 feet high, simple or corymbosely branched, clothed throughout with ample foliage, and nearly glabrous except at summit; leaflets from ovate- to oblong-lanceolate; inflorescence corymbose-cymose; pedicels rather densely villous, and somewhat viscid-pubescent; calyx cleft below the middle, the lobes triangular-lanceolate; corolla an inch long, campanulate-funnelform, yellow, with tawny red outside, tube very short, lobes rhombic-ovate, tapering to a sharp point and not at all rotate-spreading, their margin lightly undulate or erose; stamens ½–⅔, styles ⅔–¾ as long as she corolla; seeds many in each cell, scarcely winged.

Cold northward slopes of the highest Pinos Altos Mountains, New

Mexico, growing with *Delphinium glaucum*, Wats. and *Eupatorium grandidentatum*, DC., in flower and fruit Sept. 15, 1880.

It is hard to establish, and somewhat hazardous to propose new species of *Polemonium*. The claim of specific rank for this very striking and beautiful plant I base upon the shape and color of the corolla. No other species but *P. confertum* shows a corolla whose limb is really funnelform, that is, not at all spreading; nor has any other form red-yellow flowers which show no tinge of blue or purple or flesh-color, even in fading. Its nearest ally is *P. foliosissimum*, while it has more the look of *P. carneum*.

PENTSTEMON PAUCIFLORUS.—Stems 2 feet high, suffrutescent at base, and with a few strict branches; the whole plant clothed with a very minute puberulence which is retrorse, except upon the inflorescence, where it is spreading and glandular; leaves linear, sessile, 1–2 lines wide, the lower 2–3 inches long, the upper gradually shorter; racemes few-flowered (only one pedicel from each pair of bracts); sepals ovate- to oblong lanceolate; corolla tubular, more than an inch long, bright scarlet, strongly bilabiate, the three lower lobes usually somewhat reflexed; sterile filament smooth; capsules acuminate.

On a bluff of the Gila River in the extreme south-western part of New Mexico near the border of Arizona, in flower August 30, 1880. Probably rare, as only two plants could be found. The species belongs to the *Elmigera* sub-division of the genus, and the flowers look like those of *P. barbatus*, but the corolla is more deeply lobed and less stongly bilabiate than in that species, while the habit of the plant is very unlike that of any of the forms of it.

PENTSTEMON PINIFOLIUS.—Stems 1–2 feet high, shrubby and much branched, the lower ½–⅔ naked and marked with the scars of the fallen leaves, the upper branches densely clothed with linear-filiform, glabrous, sharp-pointed, one inch long leaves, which are attenuate below, but widen at the very base into ciliolate margins by which the opposite pairs are nearly, or most usually completely connate; the slender thyrsus few-flowered; pedicels and lanceolate-acuminate sepals glandular hairy; corolla an inch and a half long, narrowly tubular, scarlet, the nearly linear segments almost a third the length of the tube, the lower bearded, but not at all reflexed; capsule ovate-oblong, not acuminate.

Summits of the San Francisco range, back of Clifton, in south-eastern Arizona, growing in crevices of rocks with *Fendlera Utahensis*, Greene, and flowering in September, 1880.

A near relative of the preceding species, yet well marked, and of very different aspect, with its lower, woody branches naked, and the upper clothed with the dense pine-like foliage. The corollas are not at all strongly bilabiate, and in all the dried specimens their color has faded to yellow.

HABENARIA BREVIFOLIA.—Stem a foot or two high and stout; leaves numerous, mostly less than 2 inches long, all but the lanceolate uppermost ones loosely sheathing the stem; bracts linear-lanceolate, all but the uppermost exceeding the greenish flowers, which are numer-

ous, in a long, rather dense spike; lateral sepals linear-oblong, 4 lines long, the upper ovate; lip linear or linear-lanceolate, entire, rather acute, nearly a half inch long, shorter than the spur; anther retuse; pedicels of the pollen masses slender; glands orbicular; capsule oblong, 6–8 lines long, sessile; root fleshy-fibrous.

Dry southward slopes of the Pinos Altos Mountains, New Mexico, in open woods of *Pinus ponderosa*, in flower September 14th, 1880.

A striking species, in floral character most like *H. sparsiflora*, Watson, which grows by shady streamlets in the same region, but of very different habit, being nearly leafless, the foliage reduced to mere loosely sheathing bracts, their tips only somewhat leafy-spreading, and the stout stems flowering from near the ground.—EDWARD LEE GREENE.

Peltandra Virginica.—It is worth noting, if it has not already been done in some of our botanical serials, that Rafinesque in establishing the genus distinguished two species, *P. Virginica* and *P. undulata*. Modern botanists have accepted the former, and reduced the latter to a synonym. In the recent monograph of *Araceæ* by Engler *P. undulata* is restored to its distinctive position. Engler remarks that it has some similarity to *P. Virginica*, but differs in the inflorescence. The peduncle is shorter, not much longer than the petiole, the tube of the spathe is oblong not subfusiform, and the lamina of the spathe wholly green with no white anywhere about it. The female portion of the spadix is one-fourth to one-fifth the length of the male, while in *P. Virginica* it is two-thirds, and the ovarium is few-, rarely one-ovuled, while *P. Virginica* has never more than one. Both forms have been freely distributed as *P. Virginica*. The true *P. undulata* has been noted in specimens of Canby from Delaware, Boott from Boston, Schweinitz from Pennsylvania, Porcher from South Carolina, and Rugel from the foot of the Black Mountains in North Carolina. Both species seem about equally distributed geographically.—T. M.

Chlorophyll.—In NATURE for April 14 Mr. Sydney H. Vines gives an interesting review of the results of Dr. Pringsheim's investigations into the nature and function of this puzzling substance. Dr. Pringsheim some time ago startled physiologists by announcing that chlorophyll was not the direct agent of assimilation, but rather a screen for protoplasm which in the light thus subdued did the work. Of course such a careful and conscientious investigator must have had some sure ground to stand upon and hence this subject of the formation of chlorophyll has attracted a good deal of attention. These later observations, referred to by Mr. Vines, are considered by Dr. Pringsheim as confirming the views he had before expressed.

It may be of interest to our laboratory workers to know that Dr. Pringsheim has been using a new method of treating chlorophyll corpuscles. He treats them with a dilute acid, or warms them in water, or exposes them to the action of steam. The result is that chloro-

phyll escapes from the corpuscle, "together with certain fluid or semi-fluid substances which accompany it, in the form of viscid drops, leaving the ground substance of the corpuscle as a colorless, apparently protoplasmic, hollow sphere, with a much perforated wall."

By this means Dr. Pringsheim was able to get some little idea of the nature of Hypochlorin, a substance whose existence in chlorophyll-corpuscles he had previously announced. Under the acid treatment this substance appears as dark brown masses which eventually assume a crystalloidal appearance. From the fact that no hypochlorin can be detected when the corpuscles are warmed in water or exposed to steam it is inferred that it is decomposed by heat.

The effects of intense light upon the various cell contents are very interesting. It appears that although under ordinary circumstances the chlorophyll-corpuscles lose their color when exposed to intense light, such will not be the case in the absence of oxygen or in red light. This leads to the conclusion that this decolorization is a result of oxidation and the products gases.

An unexpected conclusion of Dr. Pringsheim is that in this same chlorophyll corpuscle are carried on the diametrically opposite functions of assimilation and respiration. The apparent contradiction is explained thus. The coloring matter of the chlorophyll-corpuscles absorbing certain rays of light permit the protoplasmic base of the corpuscles to do the work of assimilation; but this same absorbed light, thus kept from the protoplasmic base, can do the work of respiration. If therefore light is too intense these rays are not all absorbed and respiratory work overbalances that of assimilation. Mr. Vines states Prof. Pringsheim's principal results as follows:

"1. That the presence of chlorophyll favors the assimilatory activity of the chlorophyll-corpuscle in consequence of the absorption, by the chlorophyll, of light, which would promote respiratory activity.

2. That hypochlorin is the substance which is the first visible product of this assimilative activity, and that the other substances (starch, glucose, oil, tannin) which are found in chlorophyll corpuscles are derived from hypochlorin by oxidation."—J. M. C.

Some New Mexican Ferns. II.—Three Notholænas grow here, all of great beauty. The largest, *N. sinuata*. Kaulfuss, is a very peculiar fern, as well as a very handsome one. The fronds grow in clumps of five or six, and are from one to two feet long while their extreme width is less than two inches. It is simply pinnate, the pinnae large, roundish, and crenate-sinuate, alternate on the rachis, of a bright green color above, and below covered very densely with a yellowish-brown pubescence which becomes darker as the season advances. It is from the color of the lower side that it receives its common name of "The Golden Fern." It usually grows among rocks on the hillsides, where it is exposed to the brightest sunshine. When it grows in the shade is becomes very tall and slender, and somewhat drooping. It fruits during October.

Notholæna Hookeri, D. C. Eaton, rarely reaches a foot in height;

the whole height being occupied by the stalk. The palmate frond is attached to the stalk almost at a right-angle. The upper surface is of a bright light-green and the under surface is covered with a pulveraceous substance, which gives it a very bright, light yellow color, growing darker with age. When the fruit is fully mature it forms a margin of an intense black, which contrasts finely with the general surface.

It grows at the edges of rocks, in dense and rather large tufts, and is the only one of my ferns which is handsomer than *Pellæa flexuosa*. It matures its spores quite early in October. Like *Cheilanthes Lindheimeri*, it curls up and becomes unfit for pressing almost as soon as it is removed from the soil.

Notholæna dealbata, Kunze, like *Cheilanthes lanuginosa*, grows in tufts on the perpendicular sides of rocks, where there seems to be no soil whatever, and in the deepest shade. It is seldom more than eight inches in height, the fronds finely divided, and very bright colored, the upper surface being green, while below it is of a pure white. When the fruit appears it is of the deepest black, and disposed in irregular, stellate, or radiating spots. Later the fruit becomes so abundant as to almost completely cover the back of the frond. A tuft of this fern, exhibiting the fronds in various stages of maturity, the colors varying from a pure white to an almost regular black, is a very pretty object. This is one of the earliest fruiting species.

Woodsia Oregana, D. C. Eaton, resembles our own *Woodsias* in its general appearance, but the stalks are more herbaceous and delicate. It is rather common, but not abundant, growing singly under the edges of overhanging rocks at the bottom of canons, in deep shade, and always near the water-holes. My variety differs from the type in having the stalks scaly, and in having narrow wings to the midrib. The latter peculiarity is probably connected with a habitual monstrosity which will be noticed in the conclusion. It is among the very early fruiting species.

The only remaining species is *Gymnogramme hispida*, D. C. Eaton. This is quite common and abundant. It grows in very high and dry situations, but in rich soil, and moderate shade. It seems to grow more luxuriantly in the shade, but so late is it in maturing that in such situations the chances are much in favor of its being destroyed by cold and dry weather before it has fruited.

It grows to the height of two to four inches, and, like *Notholæna Hookeri*, the frond exhibits its face in a nearly, or quite, horizontal position. The frond is pedate and densely hispid on both surfaces, but most so below. The upper surface is of a rich, dark green, the under surface of a grayish-green, and late in the season, both are tinged with red. The articulation is slight, and it is difficult to avoid separating the fronds from the rootstock in pressing.

In conclusion, a few teratological notes are in order. The teratology of ferns has of late attracted considerable attention, and I believe that Mr. Davenport is at present engaged in some special studies in this direction. Attention has been principally attracted to the bifurcation of the fronds, and in the recently established "Terato-

logical column" of that enterprising botanical journal, *The Bulletin of the Torrey Botanical Club*, Mr. Davenport and others have directed attention to a number of interesting cases of this deviation. I have been here favored with an excellent opportunity of contributing to this department. Bifurcation of fronds is so common here among certain species, as to have ceased to attract any attention. It is quite common in *Cheilanthes lanuginosa*. In this species the forking is always at the apex of the frond. The forks are quite slender, and divided in like manner to the lower pinnae. I do not remember to have seen a forking pinna in this species. But in *C. Eatoni*, while the apices are occasionally seen to fork, the common phenomenon is the forking of the pinnae. In all such cases the forking does not take place at or near the apex of the pinna, but usually below the middle, and often quite near the stalk. The forks are regularly divided, or, at least, quite as regularly as the other portions of the frond, which are themselves quite irregular in their mode of division. But by far the most interesting thing found in my collecting was a frond of this species which bore, at a distance of two or three inches below the lowest pinna, what appeared to be a branch, subtended by a bract. The branch, which, with the bract, was dead and withered when I found it, though the frond was quite green, was probably a sportive pinna, and the bract a much enlarged scale. But the specimen would have well repaid a little study. I laid it away too carefully, for I have been unable to find it since.

While the above-named species have a decided tendency to sport as described, the fern which is pre-eminently characterized by this tendency is the form of *Woodsia Oregana* which I find here, and which, for this reason, I think should be distinguished by name, as a variety. Decidedly more than half of the mature plants are found to be either forked, or presenting the peculiar appearance which invariably precedes the final forked condition. For the fronds are not forked in this species when young, but gradually approach that condition. As the process is most instructive, I will describe it, regretting that time will not permit me to make drawings. Many of my subscribers will receive specimens of the abnormal form, which will serve to illustrate. The lanceolate frond is entirely green and herbaceous. The rachis, as well as the upper part of the stalk, is narrowly winged, often very narrowly. Toward the upper part of the frond this wing becomes indistinct from the widening of the rachis. It widens so as to increase from in width of scarcely a line to near a quarter of an inch, and is surrounded by a narrow wing of incised, almost lacerate frond, this enlarged terminal segment giving to the frond a sort of a lyrate appearance. This segment becomes emarginate as the widened rachis divides, and as the recurved-spreading forks lengthen, the notch in the segment deepens, until we have two distinct and well defined forks. These forks never become long or slender, but exhibit a tendency to fork again in the same manner. Sometimes the pinnae exhibit the same kind of terminal enlargement, but I have not seen one reach the forked state. It is not pleasant to draw conclusions, but it seems as though the seat of the disposition to fork is in the rachis, and

that the extended growth of the segment is in accordance with that of the rachis. This would serve to make plainer the distinction between the frond and the leaf, in which the form of the skeleton is determined by the growth of the parenchyma, which demands support.

Since writing the above, I have found among my specimens of *Pellæa Wrightiana*, a number of specimens of that very rare fern (in the United States), *P. ternifolia*, Link. Upon a careful examination of this fern there seems to be no doubt of the suggestion of Prof. Eaton, that it and *P. Wrightiana* belong to the same species. I shall, therefore, distribute it among my sets, as far as the specimens will go, as *P. ternifolia*, Link, and *P. Wrightiana*, Hooker, as var. *Wrightiana* of the former species.—HENRY H. RUSBY.

Some Additions to the North American Flora, by Dr. G. Engelmann.—DICENTRA OCHROLEUCA, n. sp. Stem erect, 3–4 feet high, leafy, leaves glaucous, large (lower ones a foot or more long), 3-pinnate, ultimate divisions deeply cleft into lanceolate-linear lobes; flowers panicled on very short pedicels, about 15 lines long, ochroleucous; membranaceous sepals suborbicular; exterior petals slightly saccate at base, upwards narrower, somewhat concave below the acute tip, and scarcely spreading; inner petals widened above into a deep purple circular tip, crested with two very broad flat and elongated appendages; stamens subulate scarcely cohering.

In valleys of the Santa Monica Mountains near Los Angeles, Cal., where it grows with the rather rare *Ceanothus spinosus*, the root-stock of which, named red-wood, furnishes the principal fire-wood there.–Together with *D. chrysantha* this handsome species constitutes the subgenus *Chrysocapnos*, in which the crest, single and inflated in the true *Dicentrae*, is formed of two distinct lamellae, flat and large in our species, short and curly in *D. chrysantha*. This latter is a coarser plant with much smaller golden-yellow flowers (6–9 lines long) and deeply concave, spreading outer petals.

TSUGA CAROLINIANA, n sp. A small tree of the southern Alleghany Mountains with larger (6–8 lines long, ¾–1 line wide), darker leaves than the common Hemlock spruce, retuse or often notched at tip, without stomata above, beneath with two pale bands, each with 7 or 8 series of stomata; strengthening cells under the epidermis on keel, midrib and edges; cones 12–14 lines long, scales oblong, much longer than wide, in 8-13 order, spreading at right angles after maturity, broad bracts slightly and obtusely cuspidate; seeds (2 lines long) with numerous (15–20) small oil vesicles on the under side, twice shorter than wing.

Mountains of North and South Carolina, on dry slopes and ridges.—Smaller, stouter branched than *T. Canadensis*, from which it is always readily distinguished by its larger, darker, glossier, more retuse leaves and by its larger cones with wide spreading scales. It was first noticed in the mountains of South Carolina by Prof. L. R. Gibbes of Charleston in 1850, who sent specimens to Prof. A. Gray in 1856 and in an accompanying letter suggested for it the name of

Pinus laxa; he obtained it from both Carolinas; Prof. Gray himself had already collected it in 1842 on Bluff Mountain, N. C., in foliage only; and last year Mr. A. H. Curtiss again met with it "on Pinnacle Mountain, N. C., a long ridge commencing about 8 miles south of Hendersonville, probably 3–4000 feet high, where in groups of only few trees it occupies slopes near the summit, and even cliffs, while *T. Canadensis* abounds in the ravines of the same region; both species are cultivated side by side at the entrance of Mr. Middleton's place at Flat Rock, 3 miles from Hendersonville, where their branches interlock and their differences are strikingly exhibited." I have not seen any young shoots of this species and therefore can not say whether their leaves are spinulose-denticulate as they are in young plants of the two other North American species. These may be distinguished thus:

T. Canadensis: leaves of the mature tree smaller (4–7 lines long), obtuse with 5 or 6 series of stomata on each side of the keel below, destitute of any strengthening cells; scales of cone in 5/8 order, orbicular oblong with broad truncate bracts; wing very broad at base, tapering, scarcely longer than the seed which shows 2–3 large oil vesicles.

T. Mertensiana has larger leaves, with two bands each of 7–9 series of stomata; strengthening cells few on the edges and very sparse on upper and lower side of leaf; cones 6–12 lines long (not 1½ inches as sometimes stated), scales oblong, mostly a litle narrowed in the middle, bracts slightly cuspidate; seeds smaller, with few oil vesicles, wings twice as long as the body of the seed.

YUCCA MACROCARPA, n. sp. Trunk several (1–4) feet high; leaves spreading, sharp pointed, concave, with entire margins; panicle subsessile with lanceolate, white, fleshy bracts; flowers not seen; fruits cylindrical not marked by any ridges, obtuse, pale yellowish, pulpy (4–6 inches long, 6–7 in circumference); seeds thick and large (5–6 lines wide, 1–1¼ lines thick), rugose-runcinated.

In ravines of the Santa Rita Mountains south of Tucson, Arizona. — Evidently closely allied to *Y. baccata*, Torr., which is found from Southern Colorado all along through Arizona to Southern California; distinguished from it by the the absence of fibres on the leaf-edges (I have rarely seen on one or the other this fibre detached from the edge, just as we find it sometimes in *Yucca gloriosa*, and *Y. canaliculata*, which ordinarily have entire edges), by the smaller, narrow bracts, and the obtuse, not rostrate fruit. The fruit is of the color of a yellow apple, rather pulpy, of a pleasant sweetish acidulous taste.

JUNCUS RUGULOSUS, n. sp. Pale green, transversely rugose and rough, stems 2–4 feet high from a stout running rhizoma, very weak, leafy; leaves septate; panicle lax, decompound, 6–8 inches long and wide; heads with hyaline bracts, 3–5–8-flowered; sepals linear-lanceolate very acute, nearly equal, the outer carinate 1-nerved, the inner 3-nerved; stamens 6, much shorter than sepals, linear anthers shorter than filaments; capsule exceeding the calyx, lanceolate, acute, 3-angled, 1-celled; seeds acute at both ends but not caudate, reticulate.

In a running streamlet at the foot of the San Bernardino Mountains, discovered by W. G. Wright, and seen there by me also in November.—With *J. asper* the only species of our flora with rough epidermis. It may be compared with loose panicled forms of *J. acuminatus* var. *debilis*, but is readily distinguished by its roughness and its 6 stamens, and then, no forms of *J. acuminatus* occur west of the great plains.

MONANTHOCHLOE LITTORALIS, Engelm., heretofore only known from coasts of the Gulf of Mexico, I found on the Bay of San Diego, Cal., where it grows with that curious *Batis maritima*, already noticed there 30 years ago by Dr. Parry.

Is Chenopodium viride, L., a good species?—It may not be advisable for amateurs in natural science to be tinkering with the limits of species, yet I cannot forbear, after more than a score of years of acquaintance, adding my honest convictions on the relation of the above named species with *Chenopodium album*, L. It was in my boyhood days, that, with hoe in hand I was called upon to wage a war of extermination on the "milfoil," or "mildew," as it is generally called by our farmers; and this, as I remember it now, was always the broad leaved form (*C. album*), and was to be found in almost every field and fence-row. During the last ten years the implement has been the botanical text-book, and I have had the pleasure of seeing the old enemy gradually growing less common. But its place is now being taken by a hardier, earlier-blooming and narrower-leaved form (*C. viride*, L.), which does not show any disposition, so far as I can discern, to become intermingled with its predecessor and weaker brother. Our modern authorities* appear to regard *C. viride*, L. as a deep green, narrower-leaved and more mealy form of *C. album*, L.; while by some of the earlier authorities this order is reversed and *C. album*, L. is regarded as possibly not a good species, and that it may simply be a variety of *C. viride*, L. The main distinctions given are, that in the former, *especially when full grown*, the stem and leaves are a paler green, that the flowers are more dense on the branches, and that it blooms in July and August. Both are said to be extensively used as potherbs when in the young and tender stage.†

The following are the differences I have observed, and are my reasons for considering them distinct species:

(a) *C. viride* blooms from four to six weeks earlier.
(b) Its general growth is more erect, the branches assuming more nearly the vertical position.
(c) The whole plant is a deeper green.
(d) The leaves are narrower, varying from ovate-lanceolate to

*Gray, Manual of the Botany of Northern U. S., Fifth Edition; Watson, Revision of N. A. Chenopodiaceæ; Wood, Class-Book of Botany.

†See a German encyclopedic work of botany by Dr. G. W. F. Pancer, published about one hundred years since, in fifteen volumes, with copperplates, and based on Houttuyn's translation and notes of the thirteenth edition of *Carolus A. Linne's System of Plants*. This is a monumental work of its period, and gives a scientific and popular description of all the plants then known.

broadly lanceolate, while those of *C. album*, L. are rhomboid. Both species drop the larger leaves early, many of them even before blooming. It is to this fact that I attribute the cause of our authorities regarding them as one species; when the leaves have fallen, so that but few of the smaller ones are left among the flowers, they are not so readily distinguished.

(e) These distinctions are constant, the two forms do not show a disposition to shade into one another. Among thousands of plants observed during the last ten summers, there never has been any doubt as to which species a given specimen belonged.

(f) *C. viride*, L., is a hardier plant, and a later immigrant into the Wabash valley; while it is annually increasing in abundance, its congener is gradually becoming less common.

(g) In regard to the mealiness, I have observed little constant distinction; probably *C. album*, L. is more mealy, especially among the flowers. The flowers are also a little larger in this species.—DR. J. SCHNECK.

New Species of Fungi, by Chas. H. Peck.—PUCCINIA MIRABILISSIMA.—Spots small and dot-like or larger and subrotund, black or blackish-brown above; sori hypophyllous, few, small, pale reddish-brown; *stylospores* subglobose obovate or pyriform, obtuse, very minutely rough, .0009–.0013 of an inch long, .0008–.0009 of an inch broad, pedicel colorless, easily separating from the spore when mature; *teleutospores* intermingled in the same sorus with the stylospores, elliptical, obtuse, constricted at the septum, minutely rough, .0012–.0013 of an inch long, .0009–.001 of an inch broad, pedicel very long, colorless.

Living or languishing leaves of *Berberis repens*. City Creek Canon, Utah, July, *M. E. Jones*.

In this singular *Puccinia* both kinds of spores are intermingled in the same sorus, but the *Uredo* or stylospores are much more numerous than the others. They appear to be joined to their pedicels by an articulation, and when mature they easily separate from these like *Trichobasis* spores, although in general appearance they closely resemble the spores of many species of *Uromyces*. The pedicels of the *Puccinia* or teleutospores are usually two or three times as long as the spores. There are from one to six sori on a spot.

PUCCINIA JONESII.—Spots pallid, indefinite; *hymeniferous fungus* with peridia short, crowded, wide mouthed, crenulate on the margin, the spores subglobose, orange yellow, .0008–.001 of an inch broad, *teleutosporous fungus* with sori mostly hypophyllous, rarely a few epiphyllous, scattered, at first covered by the epidermis, at length exposed, subpulverulent, black, the spores elliptical or oblong-elliptical, obtuse, substriate, minutely rough, scarcely constricted at the septum, .0012–.0016 of an inch long, .0008–.0009 of an inch broad, the pedicel very short.

Living leaves of *Ferula multifida* and *Peucedanum simplex*. Utah, May and June.

This species is respectfully dedicated to its discoverer, Prof. M. E. Jones. He remarks concerning the form on *Ferula multifida*, that the *Puccinia* always attacks the plant later than the *Æcidium* and that the fungus soon kills the leaf. I find no good characters by which to separate the form on *Peucedanum simplex* from the one on *Ferula multifida*. In both cases the *Æcidium* and the *Puccinia* occur on the same plant and even on the same leaf. I have therefore united the two as conditions of one species.

PUCCINIA ARNICALIS.—Spots pallid or none; sori amphigenous, clustered, crowded or confluent, reddish-brown; *stylospores* subglobose, minutely rough, .0008–.0012 of an inch broad, reddish-brown, containing one or two nuclei; *teleutospores* intermingled with the stylospores, obovate or elliptical, obtuse, scarcely constricted, minutely rough, .0012–.0018 of an inch long. .0008–.00095 of an inch broad, concolorous, the pedicel very short, colorless.

Living leaves of *Arnica cordifolia*. Colorado. *T. S. Brandegee.* Communicated by *E. S. Rau.*

The fungus was found on plants growing at an altitude of 10,000 feet. The *Puccinia* spores are intermingled in the same sorus with the *Uredo* spores and are of the same color with them. The latter have no pedicels when mature. The sori occur chiefly on or near the midrib.

PUCCINIA TROXIMONTIS.—Spots pale or obsolete; sori ampnigenous, scattered, reddish-brown or blackish-brown; *stylospores* subglobose, minutely rough, .0008–.0012 of an inch broad, reddish brown; *teleutospores* subelliptical, obtuse, scarcely constricted, minutely rough, .0011–.0014 of an inch long, .0008–.0009 of an inch broad, blackish-brown, the pedicel short and colorless.

Living leaves of *Troximon cuspidatum*. Utah. May. *Jones.*

This species is closely related to the preceding one, but differs from it in its scattered sori and in having the teleutospores in distinct and darker colored sori.

PUCCINIA ACROPHILA.—Spots brown, sometimes tinged with purple; sori scattered or crowded, reddish-brown; spores obovate or elliptical, obtuse, constricted at the septum, rough or verruculose, .0011–.0013 of an inch long, .0008 of an inch broad, the pedicel short and colorless.

Living stems and leaves of *Synthyris pinnatifida* Utah. *Jones.*

The fungus was found on plants growing at an altitude of 12,000 feet. The sori most frequently occur at or near the tips of the leaf segments, which suggests the specific name.

PUCCINIA MERTENSIÆ.—Spots none; sori amphigenous, reddish-brown, scattered or in clusters; spores elliptical, slightly constricted at the septum, obtuse, rough or verruculose, .0011–.0014 of an inch long, .0008–.0009 of an inch broad, the pedicel short and colorless.

Living leaves of *Mertensia Sibirica*, Colorado. *Brandegee*, Utah, July, *Jones.*

The fungus occurs on plants growing at an altitude of 11,000 feet. It is closely related to the preceding species and possibly future ob-

servations may justify their union. The spores in the present species are a little broader and more distinctly warted or roughened than in the preceeding one.

PUCCINIA PLUMBARIA.—Spots brown and indefinite, sometimes none; sori mostly hypophyllous, sometimes amphigenous, orbicular oblong or irregular, scattered or crowded, sometimes confluent, prominent, at first covered by the epidermis and then of a peculiar lead-color, blackish when exposed; spores obovate or elliptical, obtuse, slightly constricted at the septum, minutely rough, .0012–.0016 of an inch long, .0008–.001 of an inch broad, the pedicel very short, colorless.

Living leaves and stems of *Collomia gracilis* and *Phlox longifolia*. June and August. Utah. *Jones*.

The form on Phlox has the sori more scattered and on both sides of the leaf, otherwise I find no satisfactory mark of distinction, and believing the two to be forms of one species I have united them. The dark sori, while covered by the thin epidermis, have a peculiar leaden tint which suggests the specific name.

PUCCINIA CALOCHORTI.—Spots blackish or none; *hymeniferous fungus* with the peridia crowded, short, clustered, the spores subglobose or angular, yellow or orange, about .0008 of an inch broad; *teleutosporous fungus* with sori scattered or crowded, oval or oblong, black, the spores subelliptical, obtuse, slightly constricted at the septum, rough, .0014–.0016 of an inch long, about .001 of an inch broad, the pedicel short.

Living leaves of *Calochortus Nuttallii*. Utah. June. *Jones*.

The species is related to *P. Lojkiana*, but our fungus has the spores smaller, more obtuse and not so coarsely warted. Both the *Æcidium* and the *Puccinia* occur on the same leaf.

Isoetes lacustris.—The following note is so interesting that we reproduce it from *Nature* (April 7) and would ask our collectors to make note of any similar behavior on the part of this species in our own country:

In a paper read before the Academy of Sciences of Paris (Jan. 10, 1881.) M. E. Mer calls attention to the peculiar conditions under which different forms of this fresh-water plant seem to originate in the Lake of Longemer. The basin of this lake was once occupied by a glacier, and now presents several different sorts of bottom. The soil to a depth of two to three metres is composed in part of a gravel formed of rock *debris* united by an iron cement, in part of ancient moraines, or where near the surface these will be mixed with the remains of plants and form a pretty tenacious mud. In all these situations Isoetes is to be found, but the plants differ most remarkably both as to their form, their structure, and their mode of reproduction as they are found in the different habitats. Taking the leaf development as a guide, four varieties are easily discerned:—(1) *humilis*, growing sparsely in the gravel and sterile shallows, the leaves are not only few in number, but always of diminutive dimensions; sporange generally wanting or represented by a small cellular mass which rarely ever

forms a propagule, and then these with puny leaves; (2) *stricta*, found on the borders of the lake or in the old alluvial, therefore in less sterile quarters than the preceding; leaves more numerous, stout, but still of small size; (3) *intermedia*, growing on ground formed of a mixture of mud and clay, either on the borders of the lake or at a depth of from one to two metres; leaves quite intermediate in character between the previous variety and the next; (4) *elatior*, growing on the clayey depths, with long leaves. The first form is always found isolated, and as to its asexual reproduction there is nothing more to be said; but the other three, according as they are subject to more or less heat, present each three varieties characterized by the mode of reproduction. 1. *Sporifera*, isolated individuals, mostly furnished with well-developed sporangia, stem large, roots numerous, leaves large. 2. *Gemmifera*, few fertile sporangia, but most of the leaves are furnished with propagula, and these well furnished with leaves, generally dextral, stem fairly developed. 3. *Sterilis*, indviduals growing in compact masses, stems and roots slender, leaves not numerous, long and narrow, fertile sporangia very rare, and more often undeveloped masses of cells or abortive propagula. It would seem as if these facts had a practical interest to the collector, who may find in them a guide as to where to look for fertile specimens.

Bebb's Herbarium Salicum.—We are in receipt of the first fasciculus of Mr. M. S. Bebb's *Herb. Salicum*. Any one who has ever seen Mr. Bebb's specimens knows just how perfect and complete this bundle is. In his work towards a monograph of North American Willows, Mr. Bebb has shown rare judgment and still rarer patience. How else could he have undertaken to let a little light through that dark maze of forms which meets the eye of every botanist who has dared to look at willows? Nowhere do lines between species run so indistinctly, in fact it can hardly be said that there are such lines. Now Mr. Bebb proposes to help us just where we so much need help, and every botanist should make it a point to contribute notes and specimens that this monograph may be as exhaustive as possible. Accompanying the very complete specimens of this fasciculus are full descriptions and very many drawings of leaves and capsules, the latter enlarged to a uniform scale of twelve diameters.

We can note but a few of the many things that catch a botanist's eye in looking through the bundle. One of the most satisfactory results is the settling of Muhlenberg's *S. myricoides*. Botanists have been inclined to give it specific rank, or to make it a variety of *S. cordata*, but Mr. Bebb shows conclusively that it is a hybrid from *S. cordata* and *S. sericea*.

Another very interesting hybrid is that from *S. petiolaris* and *S. candida*, species so dissimilar that a cross was hardly to be expected. In case it should become the custom to give distinct names to such hybrids, Mr. Bebb desires to call this beautiful willow *S. Clarkei*.

A new species is proposed under the name *S. glaucophylla* and there seems to be no reason why it should not stand. Mr. Bebb has

long been hunting a place for it, first making it a variety of *S. cordata*, then of *S. Barclayi*, but it seems specifically distinct from both. It is most nearly related to *S. cordata*, but is by no means like it in habit and can always be easily distinguished. It would more likely be mistaken for *S. discolor*.

Many other forms, especially hybrids, could be noted, but those given will suffice to show the nature and importance of the work. Again would we urge all botanists who are interested in the welfare of their science to communicate with Mr. Bebb in regard to any specimens or notes they may have that would be a help in studying our willows.—J. M. C.

Leavenworthia in S. W. Missouri and N. W. Arkansas.—On a recent trip to S. W. Missouri I was rewarded by finding a species of *Leavenworthia* growing upon the *debris* of eroded limestone rocks in rich springy soil. Though growing in rocky places it was not found on the top of flat rocks, the situation usually given in the books for them. I have hunted for them upon all the flat top rocks I could find in N. W. Arkansas and S. W. Missouri and have not found a single specimen in such a habitat. The specimens were growing with *Arenaria Pitcheri*, *Sisymbrium canescens*, occasionally a specimen of *Draba cuneifolia*, *Allium striatum*, *Oxalis violacea*, *Astragalus Mexicanus* and *A. distortus*. The following is a description of the species as made in the field from fresh specimens:

Root single, annual and running deep into the soil; leaves all radical and lyrate-pinnatifid; peduncles radical, one-flowered, elongated, sometimes as many as 20 from one root, 2′–5′ high. Sepals more or less reddish-brown with a shade of purple; some were reddish brown the whole length, others have only a reddish-brown tip with a greenish-yellow base, while others are entirely greenish-yellow. Petals vary from reddish-brown to yellow like the sepals. Those flowers with dark reddish-brown sepals have the corolla distinctly reddish; some have a white blade and yellow claw, while some are light yellow throughout. The corolla has lighter corresponding shades than the calyx. Silique narrow oblong-linear, elongated after flowering, sometimes 1½′ long, flattened parallel to partition, straight in perfect specimens; sometimes torulose in imperfect specimens. Style about as long as the width of the pod and club shaped; pod often shows a purplish tinge. Seeds broadly winged, orbicular, flat, from 1–9 in each cell. Radicle straight, at an angle of 45° or even at a right angle with the cotyledons. I am inclined to think the radicle becomes more oblique as the seeds mature.

The characters seem to apply to *L. aurea*, Torr., as described in the GAZETTE, March, 1880. I obtained excellent fruit specimens and fair flower specimens, but only a limited number of either. I can furnish a limited number of fruit and flower specimens to botanists interested in this genus for twenty-five cents, the specimens including both flowers and fruit and the postage paid.—F. L. HARVEY, *Ark. Ind. Univ., Fayetteville, Ark.*

Recent Periodicals.—TRIMEN'S JOURNAL, April.—A new variety of *Carex pilulifera*, L. (var. *Leesii*), by H. N. Ridley; The Morphology of the Leaf of *Fissidens*, by Richard Spruce; A Revision of the Indian species of *Leea*, by C. B. Clarke; Notes on Shropshire Plants, by William E. Beckwith; A new Hong-Kong *Anonacea* (*Melodorum glaucescens*), by H. F. Hance; New British Lichens (*Lecanora rhagadiza*, *L. albo-lutescens*, *Pertusaria spilomanthodes*), by Rev. W. Johnson; Bryological Notes, by W. West.

AMERICAN JOURNAL OF SCIENCE. May.—Dr. Gray gives some interesting notes on the germination of the seedling of *Welwitchia*. Mr. F. Orpen Bower has been investigating the structure and development of the mature embryo and seedling from plants germinating at Kew Gardens. Two interesting facts are mentioned as having been brought to light by Mr. Bower. One is that at the beginning of germination a fleshy outgrowth is produced from the caulicle and remains in the axis of the seed, surrounded by endosperm, even after the liberation of the cotyledons. This Mr. Bower calls "the feeder," from its probable function. Morphologically it is like the "peg" in germinating squashes which has for its function the splitting of the seed coats.

The other interesting fact is that the two leaves of *Welwitchia*, so long thought to be cotyledons are not cotyledons at all, but permanent foliage leaves. The seedling *Welwitchia* after unfolding its cotyledons at once produces a two-leaved plumule, which decussates with the cotyledons. It is these leaves that remain, while the cotyledons drop off.

AMERICAN NATURALIST, May.—Some interesting investigations On the Evaporation of Water from Leaves (Transpiration) are published. The work was done in the Botanical Laboratory of Iowa Agricultural College by Miss Ida Twitchell. It is just such work as we would expect to see coming from Prof. Bessey's laboratory. The steps are carefully taken and seem to point to the idea that transpiration is more a physical than a vital action and not so very much different from ordinary evaporation after all.

TORREY BULLETIN, May.—Mr. Chas. Peck describes two new species of Fungi, one under a new genus (*Ascomycetella quercina* and *Polyporus lactifluus*), accompanied by a plate. Messrs. Ellis and Harkness add four more names to the list of Fungi (*Sphaeronema capillare*, *Sporidesmium Rauii*, *Mytilinidion Californica*, *Sphaeria consociata*). The last two have the honor of growing on the foliage of the "Big Trees" of California. Prof. J. C. Arthur gives an account of the Lapham Herbarium, now deposited in the State University of Wisconsin at Madison. A sketch of Prof. Alphonso Wood is given with a portrait.

NATURE, April.—Articles on *Isoetes lacustris* (April 7) and Chlorophyll (April 14) are referred to elsewhere.